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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 72.] DECEMBER. [1892.

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CCLXXXII.—DISAPPEARANCE OF DESERT PLANTS IN EGYPT.

Kew is indebted to Mr. E. A. Floyer, F.L.S., Inspector-General of Egyptian Telegraphs, for the following interesting memorandum on the causes of the disappearance of the arboreal desert vegetation of Egypt within historic times. It is an extract from the report (which will be published in French by the Egyptian Government) of the expedition despatched by the Khedive in 1891 to the country between the Nile and the Red Sea. The paper has a wider importance from the fact pointed out by the author that the theory he propounds "is "applicable to all countries where soil and climate are fit to produce "wild shrubs, but not fit to support cultivation":—

Disappearance of Desert Plants in Egypt.

Much attention was paid by the expedition to the botany of the valleys and deserts, but great pains were not expended in the collection of herbarium specimens. After the patient labour extending over more than 20 years of Ascherson and Schweinfurth, there was little chance of finding new specimens, even though the country explored had, in some part, been left unvisited by these eminent botanists. The score or so of plants which seemed unfamiliar where all identified by Mr. W. Carruthers, F.R.S., with those in the *Flora Ægyptiaca*. The collection of a herbarium was neglected, and attention was directed to another point.

A main geographical feature of the country is a ridge some 2,000 feet high with peaks reaching 6,000 feet above the level of the sea. And this ridge runs near the coast, sloping steeply on the seaward side and gently on the landward side. The very marked difference in the conditions on either side of the watershed seemed to offer opportunities for discovery.

It seemed that the steep and comparatively moist slopes on the east might support a vegetation different from that which struggled for existence on the drier western slopes. Such should have been the case. And the fact that it is not the case gave the clue to the theory in the present paper.

It is true that *Calligonum comosum* will be mostly found in the east, that *Tamarix* indicated a limestone formation, and that *Capparis spinosa* is rarely found except in the crevices of granite rock; but there seems evidence that some universal levelling influence has been at work, which has reduced both landward and seaward slopes to a uniform condition.

In the pastoral East botany has a wider significance and is a broader study than is fulfilled by the collection of specimens or observation of localities. It is, among the Arabs, the first thing carefully studied and known. It means the safety or destruction of their flocks. These will seem to be fair statements and free from exaggeration when the following facts are considered.

Schweinfurth gives some 2,000 species of plants as found in Egypt. Many of these are cultivated in gardens. Putting those aside there remains not a shrub or grass which has not its Arab name duly tabulated in Schweinfurth's lists. It is true that sometimes one Arab name serves for three or four varieties of the same plant. But this hardly creates confusion, and occurs less often than would be supposed probable.

Schweinfurth has tabulated over a thousand names given by the Arabs to the scanty shrubs scattered over their plains, and the esteem with which he is received amongst these people as a "writer of trees" is far higher than that accorded to those who study temples and ruins.

In the valleys of the Northern Etbai, as the natives call the country, a little boy will readily name nearly all the plants which can be shown him. True it is all the knowledge he has. From the day he can walk he goes out with the flocks, and his alphabet is the names of the shrubs on which they feed. When he grows older he follows camels, and takes a wider range geographically and learns a different class of shrubs. Presently he begins to travel, and learns geography, and he becomes an excellent geographer. To the botanical names already acquired, he adds names for granite, sandstone, limestone, slate, quartz, mica, and metamorphic rock, all of which he learns to distinguish without error, and then his equipment is complete; and, if the words he knows could be classified, it is probable that some 50 per cent. would be found to be botanical terms.

His geography is composed of five names for hills of different size and shape, and four names for valleys and ravines; and a hill lofty enough to receive the name Jebel has always a Wadi of the same name, and the hill is generally called after the valley, and the valley is called after the principal tree which grows, or which, when the name was given, grew along its course. So far is the geography connected with the botany.

In the nomenclature of the valleys another curious thing is remarked; in hardly one valley is there found the tree from which that valley takes its name. There are none of the fragrant blossomed *Moringa aptera* in the Wady Miah.

There is no *Crotalaria* in the Wadi Natash, no *Acacia tortilis* in the Wadi Arreis, no *Acacia spirocarpa* in the Wadi Somr, no *Tabernæmontana* in the Wadi Lehana. This last is an Abyssinian name. And it must be remembered that Arabic has only been spoken in these mountains for the last 1,200 years. The Rabia' Arabs who came here with the conquering 'Amr in the year 640 intermarried with the Hamitic shepherds who wandered from Massowa to Kossair. These Hamitic shepherds were known to the Nile dwellers by the generic name of Beja, a word which it seems probable is the Kensi word for "outsiders." They were "outsiders" to those dwelling in the Nile Valley.

The most northerly subtribe of the Beja were the Bishari who spoke and still speak Bishari, a language allied to Abyssinian. From the intermarriage of the Rabia' and the Bishari sprang the Abbadi (plural Ababde) who now inhabit the northern Etbai, and in whom the Semitic element is far stronger than the Bishari, a race still found in great numbers to the south. The predominance of the Semitic element may be traced in the gradual disappearance of Hamitic names for the hills and valleys. The Arab historians, writing in 800, call the mountain south of the emerald mines Karkashendah. To-day it is called by the Arabic name of Hamata (*Ficus pseudosycomorus*), an allusion to its shape. And Wadi Lehana the Valley of the *Tabernæmontana*, an Abyssinian tree, is another survival from pre-islamic days.

Where these valleys run though the soft sandstone there are, at intervals shade-giving boulders, which from time immemorial have been used as resting places for travellers. These rocks are scored everywhere with rude pictures of cows, of horses, of bowmen, and of long lines of ostriches. These animals have all disappeared. We know from history that bodies of cavalry from three to five hundred in number ranged these deserts for months without commissariat difficulties. This would be quite impossible now. A great change has come over the country, and it is a change which has affected equally both sides of the watershed.

It is not a question of geological epochs; it is a question merely of hundreds of years. So far as concerns the disappearance from these valleys of trees whose names are still known in a language and to a people who only reached these valleys 1,200 years ago, there may or may not have been a period of rain greater than at present. On this point, which is of the highest interest, Schweinfurth gives a guarded opinion. When comparing the flat and barren plains on the west with the scored and comparatively well-shrubbed valleys on the east of the Nile, he asks whether the flatness and barrenness on the west is the cause or the effect of altered meteorological conditions. And speaking of the Eastern Desert, he says, "I incline rather to the latter supposition, because in all my travels in the desert I never could persuade myself that changes of climate have occurred in the last epoch, and still less in the historical times. I rather think that Egypt in the old times of its history did not enjoy a better climate than at present. . . . . And I have abundant proofs to explain the phenomenon of erosions exclusively as results of water, wind, and general atmospheric influences." In a paper read before the Geological Society of London it was shown, as far as might be, that there was nothing to indicate a pluvial epoch. It was shown that the erosion in the plains was nearly as great as the erosion in the valleys; that atmospheric action was nearly as great as the action of combined wind and water. After all that has been said there is room for discussion about a pluvial epoch. But the disappearance of the animals who formerly dwelt here, and of the plants on which they lived, is shown to be a matter of merely 1,200 years by the fact that the names of the lost plants and animals remain in a language which has only been here during that period. And if this wholesale change can be traced home to its cause, beyond any doubt it will form a valuable contribution to botany, and can be invoked over large areas by botanists to explain, for example, the disappearance of the frankincense and spices from Southern Arabia, to explain the thousands of chariots and horsemen in Palestine, and to explain how in early times a greater fertility and population existed in many countries whose history like that of Palestine seems out of proportion to its present circumstances.

It has been stated provisionally that the Arabs entered the country with the conquest of Islam in 640 A.D. Long before this date there was among the Egyptians a strong admixture of the Semitic element. But for the purposes of the present argument this date is selected as the right one on the following grounds. The Arabs of the conquest were the nomad camel-owning Arabs. It was their establishment in the Nile Valley that permitted the camel to make with safety another stage in its advance to the west.

The camel is a peculiar property. It is very valuable and it cannot be protected. It must range in safety over a vast area. It is at once the safety and the Achilles tendon of the tribe who own it. While peace reigns it both feeds and transports its owner to fresh pastures. But in war a handful of men may remove the entire herd. Thus, so long as in the Nile Valley the Arabs were accounted "the accursed Shasu" so long was the camel restrained within the limits of Palestine and Arabia. True, the camel was used in the time of Ptolemy Philadelphus to bring merchandise across the Kina-Kosair road. But a small number of camels could carry all the Indian trade of those times. The journey takes four days. Ten camels making one complete journey each fortnight would in a year bring 40 tons of merchandise; by the Coptos Berenice route perhaps half this amount. This seems an excessive estimate for the weight of the Indian trade considering the small bulk of such articles as could pay for the long transport from India. Compare the lists pompously inscribed on stone of the articles obtained by a Pharaoh in his most glorious campaign. Nor were camels alone employed; the ass long maintained his place as the cheapest transport, and to this day donkeys are used nearly as often as camels on this trade route.

The camel master who should approach the Nile with a freight of valuable goods could at least obtain a safe retreat. The merchant who could not ensure him this could hire no camels. Since A.D. 640 the wealthy camel owners are seated on the Nile. Their camels graze in security over the now impoverished deserts. But before that time they could not spread over the country at will. They could find no long period of security. It seems probable that for purposes of transport a few old camels were brought over by hardy men willing to fight in their defence, but the stud camels remained always in Arabia.

The researches of Ritter on the gradual spread of the camel from its home in Central Asia seem to exhaust all that is known on the subject. Nor is there anything in his learned arguments in contradiction of the above passages which were written before reference could be made to the "Erdkunde von Asien." A long personal acquaintance with the camel and his Arab (and this order is used advisedly) brings one to the same conclusion as a study of the Bible, of the Egyptian monuments, of the Greek and Roman biographers and of Josephus has brought the learned scholars whose verdict is summed up by Ritter in the following general terms:—

> The camel was not introduced into Egypt so as to breed until a period which may have been even post-muhammadan. Its absence from the monuments * shows that the Egyptians never bred it in Pharaonic times.

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* It is perhaps more curious than important that the Arab word of command to a camel to kneel, "barrak," is the same as the hieroglyphic "abraka," to kneel before a god in adoration.

In the time of the Ptolemies the camel route between the Red Sea and the Nile was used by Arab camel drivers with their beasts from Arabia. And a region south of Meroe appears to have been occupied by camel Arabs. In the fourth century A.D. for the second or third time the animal was re-introduced by the Saracens. In all cases its introduction was by the Berenice-Coptos or neighbouring Red Sea Nile routes.

The introduction of the camel in the fourth century rests on the authority of unequal value of Ammianus Marcellinus. It would appear, however, to refer to such supply as might afford transport on the Berenice-Coptos road, and the opinion may remain unaffected that they only bred in Egypt when their masters were seated as conquerors in the Nile Valley.

Thus far what was fairly possible has been put forward in support of the theory that the camel and his Arab were not domesticated in the country until A.D. 640, or some 1,200 years ago.

I have seen nowhere expressed what is according to my experience the relation between the Arab, his wife, and his camel. In most cases the camel belongs to the women, and the man is the camel's herdsman. In Arabia more than in other countries important affairs are in the hands of women. In countries where a premium is awarded to inventive capacity the position may be reversed, but in Arabia, where nothing is invented, a great man is one who has married many camel-owning women.

It does seem very probable that when Islam arrived the valleys were full of the trees from which the Arabs gave them their names. It remains to apportion to the camel and to the Arab his share in the destruction of these trees. For while the camel eats the leaves and shoots, the Arab converts into charcoal the stem, root, and branch.

I incline to state the matter thus:—

So long as the valleys were all the Arab had to depend on for feeding his camels, so long he preserved his trees for his camels. But by degrees some Arabs got a footing in the Nile Valley. They hired their camels to the farmers to carry their harvest. They went back to their deserted valley and brought away the trees in form of charcoal. I think the charcoal making is an industry recent in this country. It does seem impossible to find out in history when charcoal was first known in the East. It is not possible to say that the words in use for it meant charcoal as distinct from burning wood; and the same difficulty occurs in other Eastern languages. But it is probable that the root-meaning is "black," and that charcoal-making in Semitic lands dates from prehistoric times; and for its introduction into Egypt one can only put forth the opinion based on the absence from the Nile Valley of suitable wood.

It is only the various acacias which furnish charcoal, but their disappearance drives the camel to the other shrubs. These are soon grazed as far as may be when the Arab comes with his axe and chops down the loftier boughs. Only certain trees will support, in that dry land, the continual removal of every leaf. Thus near Sighdit are mournful clusters of bare *Balanites* trunks, but every one of the Mai or *Moringa aptera* trees from which the valley takes its name has disappeared. Both *Moringa aptera* and *Balanites* form excellent camel fodder. The principal trees in the valleys of the Etbai are the acacias. Sometimes, for two or three miles a valley will show 50 or 60 well grown acacias to the mile. The proportion they bear to others may be stated nearly as follows:—

Acacia Seyal - - - - -	60
„ *tortilis* - - - - -	20

Other kinds - - - - - -	10
Balanites - - - - - -	2
Moringa - - - - - -	2
Leptadenia - - - - - -	4
Calligonum - - - - - -	2

Of the smaller camel fodder the *Basella* hardly nourishes by itself, nor do the *Panicum*, the *Crotalaria*, nor indeed any of the smaller plants. Just as grazing will not profit the Baluchi camel unless the *Salicornia* be present, so the grazing without *Acacia* is small advantage to the Arab camel.

A description of what is going on to-day will serve probably as a true description of what has been going on intermittently for 1,200 years. The process has been arrested from time to time during periods when the Nile Valley was not safe for Arabs. And it is possible that the prosperity in Egypt in which all Englishmen are rejoicing may seal the destruction of the remaining trees, and leave the country bare save of *Calotropis procera* and the plants which nourish a few sheep and donkeys, attended by herdsmen, fed by grain from the Nile Valley. The camel will then, having so to speak burnt its boats, be domesticated in the Nile Valley. And it is interesting to speculate as to how he will develop there. Already the massive Cairo camel is a type distinct from other camels, surpassing all in its cumbrous massive proportions.

In 1850 Bellefonds travelling in the country between Assuan and Abu Hammad wrote:—"There were grouped around us in the "ravines many men, women, and children. All begged us not to cut "their trees which were their sole riches. But in reality they were "only come to beg." Here I think Bellefonds misunderstood the situation. No doubt his men had cut down many branches to feed his camels and the request was genuine. To myself such requests were frequently urged, and to my camel men, also from whom no alms were expected, and who always forebore to cut when asked.

In a valley full of acacias there hangs at frequent intervals a long crook, peeled that it may readily be seen. The children, followed by their flocks, employ the crooks to shake the leaves down. One tree will feed two sheep and continue to thrive. And a man with an axe will destroy in a few minutes, as a meal for one camel, what would have supported two sheep for a year. Colston, in 1878, writes of the Wadi Huda:—"It was the first of these rich and verdant valleys which we "met with afterwards continuously during the great part of our "journey. This Wadi was full of trees, principally of the acacia kind, "called by the Arabs seyyal. We found there also a great quantity of "shrubs and plants of different kinds, among which was a kind of "broom called murkh (*Leptadenia pyrotechnica*)." In 1891 this valley contained but a few *Calotropis*, eatable by no animal, and some mangled stumps of acacias ready for the charcoal burner.

A ride up the Wadi Hullus affords perhaps the most instructive example of the process of destruction. The word "hullus" means a cloth or felt spread over a camel's back. And the valley is a curious trough running along the apex of the long ridge from Hullus to Wadi Jemal. The origin of the name is thus apparent.

On leaving the Wadi Durunkat we entered the Hullus, and rode for some miles through clusters of mangled acacia stumps. The owner of the sheep, which must shortly move elsewhere, was settled in the Nile valley. Presently we crossed a line across the path, a mere scrape of the hand in the soft soil. From this point fine umbrageous trees stood thick in the valley. Right at the highest point was camped an old

patriarch with large and well-fed herds. Here we might not cut trees. The patriach's hospitality was confined to letting our camels eat what they could reach without help of axe Only as a concession to the stranger we might with the crooks bend down boughs and hold them while the camel fed. This old man was, in Arab parlance, "kerhan," that is, an hermit from the Nile. He and his forefathers had for generations lived here. It was one of their many valleys, the one in which the water supply lasted longest. When the rains fell he spread abroad into other valleys, leaving this one to grow against the time when he should by drought be driven to return to it. But his offspring had fallen few, and the lower part of the valley had been taken by a family whose roots were in the Nile Valley.

To sum up all the facts which I have urged in the preceding pages. It seems clear that in the camel nature has created a Frankenstein which in this country is gradually devouring her. And it seems that what is applicable to this country is applicable to all countries where soil and climate are fit to produce wild shrubs but not fit to support cultivation. It seems that Nature is being slowly but surely beaten by the camel and his inevitable but improvident companion the axe. Nature fights hard. This year copious rains have fallen in the mountains, but the reply of the Arab is to send for grazing a correspondingly larger number of camels. And it seems clear that a long period of tranquillity on the Nile will so far aid the Arabs that the sheep and goat must follow the ostrich, wild ass, and cow, and the *Balanites* follow the Lehana or *Tabernæmontana*.

There is more truth than appears at first sight in the story told by the Arabs to travellers in Palestine. They say, and they generally say it as a joke, that there were formerly lions in Palestine, and that they were frightened away by the camel. It is probable that the camel has expelled the lion from Palestine, not by roaring, but by consuming the shrubs which supported the lion's prey.

CCLXXXIII.—TAJ GARDENS, AGRA.

The Taj Mahal or commonly the Taj at Agra is described in the *Imperial Gazetteer of India* "as the most exquisite piece of Muhammadan architecture in the world." It rises with its beautiful domes, "a dream in marble" on the banks of the great waterway of the River Jumna. The Taj was erected as a mausoleum for the remains of Arjamand Benu Begam, wife of the Emperor Shah Jahan and completed in 1648. The materials are white marble from Jaipur and red sandstone from Fatehpur Sikri. The complexity of its designs and the delicate intricacy of the workmanship baffle description. The mausoleum, a square of 186 feet, stands on a raised marble platform at each of whose corners rises a tall and slender minaret of graceful proportions. Beneath the great dome an enclosure of marble trellis-work surrounds the tombs of the princess and of her husband the Emperor.

"The Taj represents the most highly elaborated stage of ornamentation reached by the Indo-Muhammadan builders, the stage at which the architect ends and the jeweller begins . . .

"From the pillared pavilions a magnificent view is obtained of the Taj gardens below, with the noble Jumna river at the further end and the city and fort of Agra in the distance."

A paintiug of the Taj with its gardens is included in Miss North's gallery at Kew, No. 228.

As might naturally be supposed the Taj gardens are probably the best known and most visited in India. The superintendent has charge also of the Sikandra, Itmaduddaula, and Rambagh gardens and of the Exotic Nursery. Besides this he has the work of watching the condition of the buildings at those places. On the retirement of the late incumbent the Government of India, on the nomination of Kew, appointed Mr. Alexander Bremner Westland, late Assistant to the Superintendent of the Botanical Department at Hong Kong, to the post. Mr. Westland arrived at Agra in November 1891.

The following report was addressed to the Government of the North-west Provinces, in continuation of a memorandum by the Commissioner, dated the 16th January 1891 :—

(1.) The memo. in question describes the existing condition of the gardens and refers to two main points (1) the determining some general scheme to govern the future arrangement of the gardens; (2) the application of electric light to the gardens and buildings, with which also was connected (it being proposed to use one set of machinery for both purposes) the project of watering the gardens by steam. Number *two* has been absolutely disposed of in both branches. Under G. O. No. $\frac{51}{\text{XII-438B}}$, of 12th January 1892, the electric project has been abandoned, as I (for my part) hope never to be revived; and the recently constructed Agra waterworks will, it is believed in the near future, supply the gardens without any separate engine in the vicinity being required.

(2) There remains the first point. The gardens have been several times inspected by Mr. Ridley from Lucknow, by Mr. Phillips from Allahabad, and by several other experts. Mr. A. B. Westland, the Superintendent appointed from Kew Gardens, who has had some years experience in Hong Kong, arrived in November last. He has very properly waited to see the effects of the hot weather and has made some experiments in trimming and re-adjusting certain portions of the gardens. The joint report prepared by Messrs. Ridley and Phillips, dated 1st May 1891, has also been read. The conclusions finally arrived at are those given below in the resolutions of the Committee of the 1st June 1892 ; they are founded on a very full detailed report by Mr. Westland circulated in the preceding month.

(3.) In sum these conclusions are as follows :—In the centre avenue the existing medley of shrubs on each side of the canal is unsightly, and should be replaced by turf arranged so as to disclose the stone geometrical scrolls forming the beds, with only one or two low palms in the centre of each. This will throw out the tomb in relief and harmonise with the general character of repose which the tomb inspires.

(*a.*) The line of cypresses is to be maintained. The lofty trees (principally *Mimusops*) forming the main avenue from gate to tomb were (as described in the memo) nearly all removed in 1890. The design now is to replace them by fewer trees less lofty and less numerous and varying in each case with the trees in the adjacent plot. The few *Mimusops* still left will not be removed, but their places filled in when necessary as above. The intervals between these trees in the avenue will be filled by a border of shrubs of different kinds carefully grouped; not too high nor too continuous but allowing

glimpses through them of the interior garden plots and the walls. The walks in the garden plots (Nos. 1 to 18) will not be in irregular curves but of geometrical pattern, in several there will be no walks at all.

(*b.*) There will be fewer rose-beds, but it is hoped of a better class.

(*c.*) The fern house will be removed to a more distant site; it is incongruous with its present surroundings. In one or two of the garden plots now quite denuded of trees a few and only a few trees will be planted. As a matter of course, old and useless timber and self sown trees will be removed. The turf of the grass plots will be renewed and existing plants carefully watched and trimmed. It is Mr. Westland's opinion that the variety of the *flora* in the gardens is very rich, and ample for all purposes.

(4.) The details of the proposed work are added in the resolutions cited below [not printed]. The key to these proposals will be found in the Commissioner's note of 22nd of March last.

(5.) The general aspect of the Taj is a subject which transcends dry official statement, but perhaps this much, may here be said. Its peculiar beauty strikes the imagination as possessing at once an air of other worlds remoteness, and yet of solid immobility; the secret possibly being that the design is refined but lacks variety, while the workmanship throughout is exquisite and in exquisite material. The trees and foliage, which form a vestibule before the tomb, here breaking up and there framing the general outline, contribute to heighten and repeat its pure aspiring tone. They do grateful service, provided only that their luxuriance be restrained and that no stiff nor continuous screen be allowed to grow up.

(6.) The Committee, without pretending to any supremacy in taste, have endeavoured to work in accordance with the requirements of the place. What they have now determined has at least this merit, that it destroys or produces nothing which cannot speedily be replaced or altered, should results ultimately prove disappointing. Their aim is to maintain the buildings mantled with a due amount of foliage not too lofty nor massive; and to keep the garden-plots somewhat formal in character; green lawns with shrubs or palms being deemed more congruous than variegated flowers or abundance of roses.

They are glad to add that the present superintendent, Mr. Westland, evinces a genuine and intelligent interest in the adaptation of the gardens, and has made many valuable suggestions and improvements.

Note by Commissioner, dated the 22nd March 1892.

H.H. the Lieutenant-Governor visited the gardens on the 22nd March with me and the superintendent, the general system of laying out the gardens was again discussed.

It was agreed that the superintendent's proposal to grass the geometrical scrolled beds on each side of the water and plant in the centre a line of *Cycas* should be adopted. This plan has, in fact, already met with universal approval.

As to the cutting down the outer borders (which are at present of *Duranta* about 5 or 6 feet high) and re-modelling the plots with winding walks, his Honour expressed what is certainly my own view, and that I think of the Committee also, namely, that a certain stiffness and primness of style of gardening befit the place. Individually I go

further than this. I dislike the winding walks, and I think the borders should not be cut away, but merely reduced in places so as to give glimpses and not more than glimpses of the interior plots. The tall trees cut down by Mr. Finlay on the east side should also be replaced at proper intervals; but whether with *Eucalyptus Globulus* or some more suitable eastern tree is a question.

It is not, in my opinion, æsthetically correct that the Taj, the whole Taj, and nothing but the Taj should strike the eye from every quarter. The builders idea, I believe, to have been that this and similar palaces and tombs should be visible through long *vistas* of heavy and narrowly divided foliage, so that height, distance, and the charm of the unknown might be communicated to them. If you see them fully exposed at once to view, with only a series of devious gravel walks and multiform beds in the intervening space, there is nothing left to the imagination; and the spectator soon begins to believe that there is little difference between this and a thousand other flower gardens in all parts of the world.

(Signed) W. E. NEALE,
Commissioner.

CCLXXXIV.—INDIAN GUTTA-PERCHA.

The natural sources of supply of gutta-percha, and the possibility of their exhaustion were referred to in the Kew Reports 1876 (p. 23); 1887 (pp, 30, 31); and 1881 (pp. 38–45). A few trees, natives of the Indian peninsula, yield substances more or less similar to gutta-percha. One of these is *Dichopsis elliptica*, Dalz. (=Bassia elliptica, Isonandra acuminata).

The following note on this plant appeared in the *Report of the Royal Gardens, Kew*, 1881, p. 44:—

"This tree appears to be common on the Malabar coast, the forests of Coorg, the Wynaad, Travancore, &c. It grows to a height of 80 or 90 feet. A substance similar to the gutta-percha of commerce is procured by tapping, but the tree requires an interval of rest of some hours, or even of days, after frequent incision. In five or six hours upwards of 1½ lbs. was collected from four or five incisions. The gum is hard and brittle at the ordinary temperature, but becomes sticky and viscid on the increase of heat. It is not found applicable to all the purposes for which gutta-percha is used, but 20 or 30 per cent. of it may be mixed with gutta-percha without destroying its qualities."

The same tree is referred to in Watt's *Dictionary of the Economic products of India*, Vol. III., p. 102. In this, an extract taken from *Drury's Useful Plants of India*, suggests that the gum might be usefully utilised as a sub-aqueous cement or glue; or that on account of its perfume when heated, it might possibly be rendered of some value to the pastille and incense makers. More recently this gum has been analysed by Mr. David Hooper, F.C.S., F.I.C., Quinologist to the Government of Madras, and the results are given in the Annual Report of the Cinchona Plantations of Madras for 1891, p. 18:—

"*Indian Gutta-Percha.*—An abundance of gutta-percha milk has been yielded during the past dry weather in the Wynád by the Panchotee

tree (*Dichopsis elliptica*), and some planters have been asking for information on the subject, and inquiring whether it could be made into a commercial article. The milk has been known for some years to afford what was called Indian gutta-percha or Pala-gum, and has been used as an adulterant of Singapore gutta. General Cullen brought it to notice 35 years ago, and Dr. Cleghorn published a memorandum on the subject at the time. It was reported upon by experts in London, who found that it was unfit for water-proofing purposes, as its solution in coal-tar and turpentine dry up to such a brittle consistence that the fabric is useless. It could be used as a birdlime or cement, and keeps well under water, as a cable insulator, especially if mixed with some genuine gutta. By boiling the milk of the Panchotee tree, a white mass separates, which can be kneaded by the fingers, but which becomes hard and brittle when cold. The brittle character of this substance I find is due to a large proportion of a crystalline substance found also in true gutta, and called crystalban or alban. Crystalban, according to Payen, occurs to the extent of 14 to 19 per cent. in the best kinds of gutta-percha, but I have extracted as much as 69·2 per cent. of crystalban from the dried secretion obtained from Wynád. The presence of a large quantity of crystals in this gum, of course, would interfere with its utility, but crystalban is easily removed by boiling alcohol, and the residue consists of a very good and pure gutta-percha. I cannot see why this process could not be used to purify the Indian gum and so obtain an article similar to the Malayan article."

A note on a gum from a closely allied plant (*Dichopsis obovata*, C. B. Clarke) received at Kew from Burma appeared in the *Kew Bulletin*, 1892, p. 215.

CCLXXXV.—GOLD COAST BOTANICAL STATION.

The establishment of a botanical station at Aburi, a hill village in the colony of the Gold Coast, was noticed in the *Kew Bulletin* for July 1891, p. 169. This station continues to be carried on with considerable success. It has received throughout the warm support and the personal interest of the Governor, his Excellency Sir William Brandford Griffith, K.C.M.G., and its mission of usefulness in the colony is becoming more and more appreciated. The following correspondence, with a copy of the last annual report on the work of the station for the period ended the 30th June last, has recently been communicated to Kew by the Secretary of State for the Colonies:—

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR, Downing Street, 15th October 1892.

I AM directed by the Marquess of Ripon to transmit to you, for your information, a copy of a despatch from the Governor of the Gold Coast, enclosing a report on the progress and condition of the Botanical Station at Aburi for the period ended 30th June 1892.

I am, &c.

(Signed) JOHN BRAMSTON.

The Director,
Royal Gardens, Kew.

The GOVERNOR of the GOLD COAST to COLONIAL OFFICE.

Government House, Christiansborg Castle, Accra,
9th September 1892.

MY LORD,

IN continuation of my despatch, No. 37, of the 11th February, I have the honour to transmit, for your Lordship's information, copy of a "Report on the progress and condition of the Botanical Station at "Aburi, for the period ending 30th June 1892," which has been received from Mr. Crowther, the Curator of the station.

2. The report is both interesting and satisfactory, and the fact that the public are taking an interest in the educational work which the establishment of the Botanical Station was intended to promote is shown by the quantity of seedlings of Liberian coffee, and fruit and other plants, which were sold during the half year, and produced a sum of 51*l.* 8*s.* 6*d.*

3. Irrespective of the purchase of plants, I am informed by Dr. Easmon, who takes great interest in the work of the station, and also by many native gentlemen, that the people are imitating what they see of the system of cultivation at Aburi as to the preparation of land for plants, the due distances of these from each other so as to admit of ventilation and a fair area of soil for the root support of each plant, keeping the land free from weeds, and attending to it as they have never done before. Even as regards the culture of that most valuable vegetable and fruit, the plantain, the people are thinning out the mass of trees which grow in wild luxuriance, but which from their overcrowded state produce only poor and insignificant bunches, leaving clumps of "trees," as they are called, at greater distances from each other than heretofore, and diminishing the number of plants in them, with the result that those remaining become vigorous and robust, and produce finer bunches.

4. The tank at Aburi, the erection of which your Lordship was pleased to sanction, and which is capable of storing 100,000 gallons of rain-water, has been of invaluable service to the station. It was completed before the early rains began in April, and quickly received as much water as filled it to the depth of 8 feet 5 inches, equal to about 60,000 gallons of water. Since the 8th of June up to a fortnight ago, when $\frac{42}{100}$ths of an inch of rain fell, neither at Aburi nor Accra has there been a drop of rain, so that without the water from the tank at Aburi to support them the young plants would have suffered very much, indeed those of a more delicate nature than others, particularly cacao, would have died.

5. My visit to the Krobo countries between the 17th and 30th of July last gave me an opportunity of observing the excellent work Mr. Crowther has been carrying out. The place seemed as if transformed since my visit to it in March and April. The frontage land was artistically laid out in beds and walks, and planted with flowers and shrubs, besides being a nursery for Eucalypti, Beefwood, Shea butter, Kola nut and other valuable plants. A patch of about an eighth of an acre of land was under the most luxuriant growth of Annatto, the stem of each shrub bending under the weight of a cluster of seeds nearly as large as one's fist. The soil seems admirably adapted for the cultivation of this plant.

6. Young seedlings of the Royal Palm (*Oreodoxa regia*), which appears to be unknown on the Gold Coast, and of the Cocoa-nut palm, have been planted at suitable distances on what I may term the frontier land of the station, and in one or two instances in avenues within the plantation.

In a few years they will add wonderfully to the natural beauty and attractiveness of the place.

7. The Government is greatly indebted to Mr. Thiselton-Dyer, C.M.G., the Director of the Royal Gardens at Kew, and to his able assistant, Mr. Morris, for the kind, continuous and invaluable support they have given to the Botanical Station at Aburi by gifts of valuable plants; and especially by the selection of Mr. William Crowther for the post of Curator at Aburi. Mr. Crowther has proved himself admirably fitted for the duties devolving upon him, and his courtesy and attention to visitors to Aburi has gained for him the esteem and goodwill of all who for purposes of health or curiosity have resorted to his station.

8. For various reasons I am of opinion that it would be of a considerable advantage to the colony as well as to the Curator if he had an opportunity afforded to him of visiting Botanical Stations in other tropical countries, say the West Indies, so as to compare the system he pursues at Aburi with the systems obtaining in those countries; and I propose to do myself the honour at a later date, of submitting my suggestion, with the arrangements which will be required for carrying it out, in a practical shape for, I hope, your Lordship's favourable consideration.

I have, &c.

(Signed) W. BRANDFORD GRIFFITH,
Governor.

The Right Hon. the Lord Knutsford, G.C.M.G.,
&c. &c. &c.

(Enclosure.)

Mr. CROWTHER to the COLONIAL SECRETARY.

Botanical Station, Aburi,
1st September 1892.

SIR,

I HAVE the honour to submit, for the information of his Excellency the Governor, the report on the progress and condition of the Botanical Station at Aburi, for the period ending 30th June 1892, and also to report upon my visit to the coffee and cacao plantations of Messrs. Miller Brothers and others on my return from leave of absence in January last.

2. I regret that there has been so much delay in sending in my reports, but I have had so much work which required my personal attention and supervision that I have experienced a difficulty in sending them in earlier.

3. I arrived at Accra in the R.M.S. "Nubia" on the 8th of January, and immediately proceeded on board the steamship "Kinsembo" to return to Cape Coast, at which place I arrived at 10 p.m. on the 11th instant.

4. On my way to Cape Coast I noticed a small quantity of the Bass fibre being shipped from Appam. This valuable fibre is obtained from the palm which is so common and plentiful in this part of the colony, namely, *Raphia vinifera*. It is a very important product, being worth from 20*l*. to 60*l*. per ton according to quality. Great interest is at present shown in England in the discovery of similar fibres to this, and there is a good market for them, but the supply is very small, owing chiefly, I think, to the difficulty experienced in extracting and cleaning the fibre. It is chiefly used for brushmaking. I will make inquiries and endeavour to obtain information respecting suitable machinery for cleaning and preparing this fibre, which information, if

I am able to procure it, shall be published in my next report. [See *Kew Bulletin*, 1891, p. 1.]

5. On my arrival at Cape Coast I went to see Mr. Batty, Messrs. Miller Brothers and Co.'s agent, who kindly gave me quarters for the night, and the next day I proceeded to Elmina to visit Mr. Hutchinson's coffee plantation.

6. Mr. Hutchinson calculates that he has about 150 acres planted with LIBERIAN COFFEE, and that he has planted out 60,000 plants. The trees are in a very healthy and flourishing condition, and many, which have only been planted a year and a half, are already bearing a very fine crop of coffee. The trees on this plantation are in three stages, viz., 1st, there are a number of trees which were planted in May 1889. These trees are about five and a half feet high, and are compact, bushy plants, bearing a splendid crop of coffee, some of which was ripening at the time of my visit. 2nd. A large area was planted in May 1890; these have grown well and almost all of them are bearing a first crop of coffee. This speaks very well for the suitability of the soil and situation for coffee planting as in Liberia and other places where this variety of coffee is grown, planters never expect the trees to bear until they are three years old. 3rd. The remainder of the trees, which comprise the greater part of the plantation were planted in May of last year, and on the whole are growing satisfactorily. Owing to the excessive dryness of the last season the mortality amongst the plants has been rather excessive, but that can be easily remedied by filling up the vacancies during the coming rainy season with good robust plants.

7. The plantation is in a very creditable and flourishing condition. The work is done by a gang of 70 Krooboys and the land is kept in good order and free from weeds. Mr. Hutchinson seems to thoroughly understand the work, and has every confidence in the ultimate success of the undertaking.

8. The next morning, on my way from Elmina to Messrs. Miller Brothers plantation at Kuby Kul, I was asked to visit a coffee plantation belonging to Mr. Ter Meulen, who accompanied me himself.

9. This plantation is about 25 acres in extent and consists of about 5,000 plants, all of which look very healthy. Many of the trees, which are about three years of age, are bearing an immense crop of coffee and others of two years' growth are also bearing. Mr. Ter Meulen informed me that he had been unable to personally superintend his plantation as much as he would have liked, and consequently it had been rather neglected.

10. After spending an hour or two going over the plantation and directing Mr. Ter Meulen as to the best means of carrying on the work, I proceeded on my way to Messrs. Miller Brothers' plantation at Kuby Kul, where I arrived at 12.30 a.m.

11. Mr. Ter Meulen proposes to extend his coffee plantation very considerably, and is now raising a large quantity of young plants for that purpose. He is very energetic about the matter and very sanguine as to the results.

12. Mr. Batty met me at Kuby Kul, and after resting a short time, I commenced to go over this plantation along with him. I should calculate that the area of this plantation is between 130 and 150 acres in extent. The land is undulating and the soil a black mould and very rich, and I should say remarkably well adapted for the cultivation of coffee and cacao. The trees here are much more luxuriant in growth than those at the other plantations mentioned. This may be accounted for by the extra rainfall and humidity experienced here.

13. Mr. Batty has planted his coffee plants 14 feet apart, which, considering the growth they have already made, does not seem too much. The growth of some of the trees on this plantation is almost incredible. Many of them have grown as much as five feet in one year, and the foliage is of great size and most luxuriant.

14. Besides coffee, Mr. Batty has also planted cacao on an extensive scale. This valuable product seems to thrive equally as well as coffee, the plants which I saw being in a healthy and flourishing condition, especially the ones supplied from the Botanical Station at Aburi during the previous year. The cacao is planted at distances of 13 feet apart and shaded with plantains and bananas, which answer the purpose admirably.

15. Tobacco was also being tried by Mr. Batty. He had about 2,500 plants each of the Havana and Sumatra varieties. They were well-grown plants, with enormous leaves of a good texture, and if the operation of curing has been successful should produce a good marketable article.

16. After my visit to the Cape Coast district I returned to Accra and proceeded to Aburi, where I arrived on the 22nd January.

17. On my arrival I commenced at once to clear the land purchased by the Government from the Rev. A. W. Clerk, and succeeded in clearing the bush from the whole of the 16 acres during the months of February and March. The weather during this period was excessively dry and very suitable for this kind of work.

18. This land, which adjoins the land already possessed by the Government, was covered for the most part with dense bush and large trees, interspersed with a large number of palm trees (*Elæis guineensis*). It is a valuable piece of land, consisting for the most part of a rich black vegetable mould, and free from stones and gravel, with the exception of a small tract of about an acre in extent near the Akropong road, which is rather stony.

19. I have used a part of it as a vegetable garden, and found that potatoes did splendidly, having had a good crop of excellent potatoes from seed which was got out from Messrs. Sutton and Sons, Reading. Corn, cassava, sweet potatoes, &c. have also been planted on this new land. They assist in keeping down the undergrowth and bringing the land under cultivation, and the produce comes in useful for feeding pigs, a good breed of which I brought out from England with me.

20. A small grove of palm trees has been allowed to remain. These I propose to thin out to reasonable distances apart, and clean and trim up the remainder, then run a fence round and allow the pigs to run about in. They will be well protected from the sun, and the palm nuts make very good food.

21. After I had completed the clearing of this land I made a 12 foot road round it, and planted a boundary of cocoanut palms at distances of 25 feet apart. These form an excellent and permanent boundary, and I am pleased to say are all growing well, not one having died through the dry season experienced since they were planted. This boundary of cocoanut palms has been continued around the whole estate, about 300 plants having been planted out in this way.

22. On the land formerly cleared and under cultivation a great amount of work has been done. On my return I noticed that cacao on the land extending from the west end of the house to the town of Aburi had not grown as well as it should have done, and could see that the cause was want of shade. Plants of castor oil (*Ricinus communis*) had been planted, but they had grown up spindly and did not afford sufficient protection, so I have planted bananas and plantains between

the rows of cacao at distances of 12 feet. The whole of this patch, which is about 13 acres in extent, has been planted in this manner, and the plants are now growing satisfactorily.

23. The land in front of the house, and extending to the Akropong road, has been completely planted with Liberian coffee. Also a small plantation of Arabian coffee, consisting of 300 plants, has been laid down. This variety of coffee is grown rather extensively by the natives in this district and thrives extremely well. I obtained the plants from the Rev. A. W. Clerk, in exchange for cacao plants.

24. The avenue of oranges leading to Aburi and as far as the Akropong road has been completely planted with new varieties of oranges, raised from seeds obtained from the West Indies.

25. Besides the work above mentioned a large amount of road making, laying out, and planting has been done. In front of the house a small flower garden has been laid out, which improves the look of the place very much.

26. A path 4 feet wide has been cut from opposite the billiard room door at right angles to the house, and extending 600 feet to where it meets the Aburi road. A small border of flowering plants has been planted on each side. This affords a nearer approach to the house and looks very well.

27. An avenue of ORANGES and CITRON 20 feet wide has been made, which cuts the above-mentioned path near the centre, and extends from the Akropong road, below the police huts, to the road leading to Aburi. It is 700 feet long. The trees are growing well, and will form a splendid avenue in a few years.

28. An avenue of ROYAL PALMS (*Oreodoxa regia*) has been planted at distances of 25 feet apart across the land purchased from the Rev. A. W. Clerk. This avenue extends from the Akropong road near the new house in course of construction by Mr. Clerk, to the western boundary. It is 800 feet long, extending across a level portion of the land. The plants are growing well, and, in a short time, this will make a splendid avenue.

29. Many of these roads have been covered with rubble from the old walls surrounding the enclosure behind the house. This forms excellent material for road making, as it sets hard, and weeds, &c. will not grow in it.

30. The weather for the period under review has not been at all favourable for agricultural purposes. It has been exceptionally dry with a prevailing dry wind, which has been most injurious to plant life. The rainfall for the six months was 25·77 inches, which compared with the corresponding period for the two previous years was very small.

31. The rainfall, besides being so much smaller than in previous years was not so well distributed over the period. The whole of the rainfall in June (3·34 inches) fell in a deluge on the 11th of that month, doing considerable more damage than good, and the whole period has been marked by occasional heavy rains and long intervals of hot and dry weather.

32. The benefit of the new tank which was completed in November last has been felt during the present season. I have no hesitation in saying that half the plants on the station would have succumbed had it not been for the water obtained from this source.

33. As an instance of the amount of water used I may mention that the tank is 80 feet long, 25 feet wide, and 14 feet deep. On the 12th of June, after the heavy rainfall above mentioned, the tank was at its highest, and had 8 feet 5 inches of water in it. On the 28th of the

same month, it had been lowered to 7 feet 3 inches, and on the 5th of July to 6 feet 9 inches. This means a large volume of water, and also a large amount of extra labour for the staff employed.

34. The plants previously planted out have on the whole grown well.

35. VINES.—These have not done so well as I expected. On my return I took out the old soil around the roots for a distance of 3 feet and 2 feet deep, and filled in the space thus made with good soil and compost. I then shaded the plants and watered them well. They made a good growth, and went on well for a month or two, but have again fallen off. No doubt this can be partly accounted for by the extreme dry weather, but I think also that the site and soil is not suitable, and I propose to remove them to another part of the garden, where I trust they will do better.

36. COFFEE.—The plants previously planted have grown extremely well, and have a very vigorous and healthy appearance. About 2,500 plants which were planted-out this spring are also growing satisfactorily although they have had to be continually watered on account of the dry season.

37. CACAO.—As I before remarked, this has not done so well on account of lack of shade, and also the dry weather experienced. Now that the matter of shade has been attended to, they are growing better and I hope they will continue so.

38. ANNATTO (*Bixa Orellana*).—This valuable dye plant seems to have adapted itself well to the soil and situation. It is now producing an abundance of seeds, from which I propose to prepare a sample of "roll" or "flag" annato, when ripe. The colouring matter washed from the seeds, and made into rolls or paste is called "flag" or "roll" annato, and is the best mode of preparing it.

"There is a steady demand for good annato made up into this form, and as the freight and other charges would be less on paste than on seeds there is a distinct inducement to adopt the preparation of paste. While the price of seeds varies from 1½*d.* to 3*d.* per pound, the price of paste ranges from 6*d.* to 1*s.* 8*d.* per pound, according to quality."

39. FRUIT TREES.—The whole of the fruit trees planted are growing satisfactorily. Mangoes, shaddock oranges, sapodillas, avocado pears, star apples, &c., &c., are making fine trees, from which I hope in a short time to obtain fruits. A Loquat tree planted before my arrival has fruited during the present season, and some of the citrons and oranges are showing signs of blossom.

40. BEEFWOOD (*Casuarina equisetifolia*).—A large number of these plants are now raised at Aburi. This tree is stated to possess every property that is usually attributed to the Eucalypti family, and the extensive planting of it would undoubtedly be most beneficial to the colony.

The following plants have been sold from the Botanical Station, viz.:—

		£	s.	d.
Coffee, 12,000 at 1*d.* each	- - -	50	0	0
Coffee, 110 at 1½*d.* „	- - -	0	13	9
Oranges, 32 at 1½*d.* „	- - -	0	4	0
Lemons, 3 at 3*d.* „	- - -	0	0	9
Cocoa, 40 at 3*d.* „	- - -	0	10	0
		£51	8	6

42. Cacao plants were also exchanged for 300 plants of Arabian coffee, and several plants have also been distributed free.

43. The following plants and seeds have been received during the half year. [Here follows lists, not reproduced, of 40 plants and nine lots of seeds received from the Botanical Gardens, Trinidad; of vine cuttings and numerous seeds received from the Royal Gardens, Kew; and seeds received from his Excellency the Governor.]

46. VEGETABLES.—The growing of European vegetables has not been so successful during the present season as it was last year. The weather has not been suitable, and further I find, that the seeds obtained this year were not so good as formerly, many of them not germinating at all. Potatoes, peas, and French beans have grown the best. Potatoes grown from sets obtained from Messrs. Sutton's and Sons, Reading, did very well indeed. The varieties grown were Magnum Bonum, Beauty of Hebron and Sutton's Abundance. The latter variety produced the finest crop of potatoes. Many new vegetables are being tried, as for instance, Globe artichokes, Asparagus, Seakale, &c., &c., and so far they are growing satisfactorily.

* * * * *

I have, &c.

The Hon. the Colonial Secretary, Victoriaborg.

(Signed) W. CROWTHER, Curator.

CCLXXXVI.—RAMIE MACHINE TRIALS AT NEW ORLEANS.

The latest information connected with the extraction of fibre from Ramie (*Boehmeria nivea*, Hk. and *Boehmeria nivea* var. *tenacissima*, Gaud.) is contained in a Report on the recent trials of Ramie decorticating machines held under the authority of the U.S. Department of Agriculture at New Orleans. The trials took place on the 30th September last, and the Report of the Board of Experts, acting as jury, has just been published.*

The results of the New Orleans trials do not appear to carry us any nearer to the solution of the problem that has been so long under consideration in regard to the extraction of Ramie fibre. The machines presented do not appear to possess any advantages over those tried at Paris in 1888 and 1889, and fully discussed in the *Kew Bulletin*, 1888, p. 273, and 1889, p. 268,—while they are apparently inferior to the machines tried also at Paris under the auspices of the *Société des Agriculteurs de France* in September 1891.

The following extracts are taken from the United States Report:—

MACHINES ENTERED.

"The official trials of Ramie machines, under the auspices of the office of fibre investigations of the U.S. Department of Agriculture, set for the last week in September at Audubon Park, New Orleans, came off on the 30th of September, and included trials upon jute stalks as well as upon stalks of Ramie.

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* The United States Department of Agriculture. Division of Statistics. New Series: Report No. 99, September and October 1892. Washington Government Printing Office, pp. 347–354.

"Three machines were entered for trial as follows:—The Kauffman machine, by the Kauffman Fibre Company of New Orleans, La.; the Felix Fremerey Decorticator, by the Felix Fremerey Decorticator Company, of Galveston, Texas; the Fibre Delignating machine (known as the J. J. Green machine) of the United States Fibre Company of Versailles, Ky.

"*The Kauffman machine.*—According to the entry of this machine it requires 15-horse power; it works upon green stalks stripped of leaves and upon dried stalks. Four attendants are required to run it; floor space occupied 6 by 14 feet. The machine is termed a decorticator for ramie, jute and hemp. . . . . .

"*The Fremerey machine.*—In the entry of this machine about 5-horse power is stated. The machine is arranged to work upon green stalks, either stripped or with the leaves and upon dry stalks. It occupies a floor space of about 5 by 18 feet. The machine requires five attendants, three of whom may be boys. . . . . .

"*The J. J. Green machine.*—Ten-horse-power is named as the power required to drive this machine. The entry states that it works upon dried stalks (but it is also expected to work green stalks wish or without leaves). Five attendants are required for full capacity, three of whom may be boys; it occupies a floor space of 8 by 12 feet."

Trials on Green Stripped Ramie.

"The first trial was with the Kauffman machine, 500 pounds of green stripped stalks having been weighed out for the test. Of this amount 332 pounds of stalks were run through the machine in 42 minutes, when the machine clogged. The result in wet ribbons was 88 pounds, and 168 pounds of stalks remained unworked, owing to the inability of the machine to proceed further.

"The second trial was with the J. J. Green machine, 500 pounds of green stripped ramie stalks having been weighed out fer the test. Of this quantity 225 pounds of stalks had been delignated in 1 hour and 35 minutes, producing 57½ wet ribbons, 275 pounds of green stalks remaining unworked, owing to the inability of the machine to proceed further.

"Mr. Fremery declined to enter this trial after 500 pounds of green stripped ramie stalks had been weighed out, claiming that the stalks were too uneven in size, the construction of his machine requiring medium stalks."

Conclusions.

In a review of the results of these trials, Mr. Charles Richards Dodge, special agent in charge of fibre investigations, reports as follows:—

"While the figures for a day's work, based on the results of short running, are wholly misleading, it is interesting to note that the output of the Kauffman machine, during the 42 minutes of continuous work before it clogged, represents 4,743 pounds of green stalks in 10 hours of continuous action, or a little over 2 tons, with an output of 1,257 pounds of wet ribbons, equal to about 420 pounds of dry ribbons, which weight would be considerably reduced after the loose hurds and woody matter remaining in the ribbons produced by this machine had been eliminated.

"In like manner, were the J. J. Green machine to run continuously for 10 hours, turning out ribbons at the rate of speed shown when in actual operation (that is, deducting the 67 minutes spent in cleaning and re-adjustment) the output would have shown a capacity of 4,821

pounds of stalks and 1,232 pounds of wet ribbons, equal to about 410 pounds of dry ribbons. But, as shown, both machines were unable to finish the 500 pounds of stalks weighed out to each for the trial.

"The results of the New Orleans trials are satisfactory as far as they have demonstrated the status of the machines entered, and established an American record that gives a starting point for future comparison, as the results of other trials are made known. It is to be regretted, however, that a larger number of machines was not represented. In this report comparisons cannot be made with the best foreign machines, though I shall endeavour to cover the whole ground in a special report, Bulletin No. 5, Fibre Investigations, to be issued at an early date."

The trials with Jute stems were very similar in their results to those noted in the case of Ramie stems. There was no conclusive evidence either way. The best results with Jute stalks as far as they went, were given by the Kauffman machine. This cleaned 100 pound of stalks in 20 minutes, yielding 32 pounds of wet ribbons. The ribbons were described "as well delignated with a very small per-centage of woody waste. The fibre occasionally was somewhat broken."

CCLXXXVII.—EARL OF BUTE'S BOTANICAL TABLES.

In the historical account of Kew (*Bulletin*, 1891, p. 291) reference is made to this rare work. Since that was written we have had an opportunity, through the gracious permission of the Queen, of examining the copy in the Royal Library at Windsor which formerly belonged to Queen Charlotte, to whom the work was dedicated. We are greatly indebted to the Queen's Librarian at Windsor, Mr. R. R. Holmes, for his courtesy in personally bringing the volumes to Kew at some trouble to himself.

Seeing that the Earl of Bute resided at Kew, and that the "Botanical Tables" were, probably in part prepared there, some further particulars of the publication may be given in this place.

On the fly-leaf of the first volume of the Windsor copy is the following note in pencil, written by the Rev. John Glover (appointed Royal Librarian by William IV.) :—"Of this work only 16 [sixteen] copies "were printed for presents, at a cost, it is said, of more than 10,000*l*. "This copy belonged to Queen Charlotte, and was purchased at the "sale of Her Majesty's library for, I believe, 100*l*."

Dryander, however, a contemporary of Lord Bute, and librarian to Sir Joseph Banks, states (Cat. Bibl. Banks, iii., p. 133) that only 12 copies were printed, and this statement seems to be substantiated by the following transcript of a note in Sir Joseph Banks's handwriting, wafered into the last volume (IX.) of his set, now in the British Museum.

Number of copies of Lord Bute's Botanical works extant:—

Lord Bute - -	2	One of the copies sold at Mr. Tighe's sale in March 1798 for 120*l.* supposed to be bought by the Earl of Gainsborough.*
The Queen - -	1	
Empress of Russia -	1	
Sir Joseph Banks -	1	
M. De Buffon - -	1	At the King of France's Library.
Lady By. Mackenzie -	1	
Lady Ruthven - -	1	
Lady Macartney -	1	
Duchess of Portland -	1	Now Lady Bath's.
Mrs. Barrington -	1	
Mr. Dutens - -	1	
	12	

The full title of the work runs thus:—

Botanical Tables
containing the different Familys of
British Plants
distinguish'd by a few obvious parts
of Fructification rang'd in
a Synoptical method.

[1785.]
[Drawn and engraved by J. Miller-
Johann Sebastian Mueller.]

We have not been able to find a single date connected with the work except that given above in brackets, which is in the first volume of the British Museum copy, and probably in the handwriting of Sir Joseph Banks.

A detailed collation of the work would be rather tedious, as the headings are numerous; but the general nature of the contents may be indicated. There are nine quarto volumes besides a thin volume of letterpress of 51 pages, entitled "Introduction to the General Tables of Plants." This is said to be wanting in the Banksian copy, now in the British Museum; but Dryander includes it in his collation, at the end of volume i., as though bound in with it.

In this volume of the Windsor copy are the two following notes, on loose sheets of paper, in a very shaky though picturesque handwriting, evidently from the nature of the contents that of Lord Bute himself.

"Notwithstanding the Gracious Reception this work met with it is now sent with the utmost diffidence, for although the subject is pleasing, is in truth of too trifling a nature to admit the flattering Idea of its drawing much of Your Majesty's attention."

"These Pages contain a fuller Explanation of The Tabular Method. They are an Introduction to the General History of Vegetables, a very extensive Plan great part of which is done, but there remains still too much for a man at the Extreme of Life to finish."

It may be taken as probable that the date at which these notes were written is about 1785. Lord Bute died from the effects of an accident in 1792.

* This note was pencilled by Dryander, and inked in afterwards apparently by another hand, as we are informed by Mr. B. Daydon Jackson, who kindly made the transcript.

Vol. i.—Pictorial title page followed by dedication to Queen Charlotte in the following words:—

To the Queen.

MADAM,

EXTREMELY flattered with Your Majesty's gracious condescension I place this Work composed solely for the Amusement of the Fair Sex under the Protection of your Royal Name, happy in having this last opportunity of testifying the Respect and Veneration with which I ever have been and ever shall be

Your Majesty's
most devoted and
most obedient
humble servant,
BUTE.

This volume contains further introductory matter and "Observations of the general Character of British Plants," and "Characters of the Genera"), illustrated by 53 plates, with 253 pages of letterpress, in addition to an intercalated "Appendix" and the letterpress explanatory of the figures, which is not paged.

Vol. ii.—"The Different Parts of the Fructification in each Genus of the British Plants represented in Figures." "Figures of the Genera," tables i–viii. 96 plates and pages 1–98.

Vol. iii.—"Figures of the Genera," tables ix–xiv. 96 plates and pages 99–192.

Vol. iv.—"Figures of the Genera," tables xv–xviii. 96 plates and pages 193–290.

Vol. v.—"Figures of the Genera," tables xix–xxii. 97 plates and pages 291–387.

Vol. vi.—"Figures of the Genera," tables xxiii–xxvii. 124 plates and pages 388–510.

Vol. vii.—"The Characters of the Species of British Plants." Pages 1–294.

Vol. viii.—"The Characters of the Species of British Plants." Pages 295–569.

Vol. ix.—"Some Observations on the Terms employed in Botany." "Figures of the different parts of Plants." 90 plates, with letterpress opposite, and 58 pages of glossary.

Altogether the work contains 654 plates, all of them apparently drawn and engraved by John Miller, an excellent German artist—Johann Sebastian Mueller, who thus anglicised his name.

In Dryander's collation of Lord Bute's "Tables," he says, concerning the ninth volume:—"Figuræ hæ, terminos botanicos explicantes, omnes "redeunt in J. Milleri. Illustration of the Termini Botanici of Lin-"nœus." We have not seen a copy of the London edition of the work referred to, but in an edition printed at Frankfort the figures are not exactly the same, though some of them are evidently only slight modifications.

In the Kew library we have a volume of proofs before lettering of exactly one third (218) of the plates of Lord Bute's "Tables"; and the same volume contains 10 others which do not appear to have been published. These plates were purchased of Rowsell in 1863 for the sum of one guinea, but without any history. They include some from each of the volumes.

CCLXXXVIII.—MISCELLANEOUS NOTES.

Mr. John Masters Hillier, lately an attendant in the Museums of Economic Botany, has been appointed, on the results of an examination before the Civil Service Commissioners, an Assistant in the Royal Gardens to date from September 6th last.

Mr. William Watson, lately senior foreman and acting assistant curator of the Royal Gardens, has been granted a certificate by the Civil Service Commissioners as Assistant Curator under clause vii. of the Order in Council of the 4th June 1870.

A Filmy Fern, No. 532, gathered by Messrs. H. H. and G. W. Smith in the island of St. Vincent, West Indies, and distributed under the name of *Trichomanes lucens*, was included under that name in Mr. J. G. Baker's paper in the *Annals of Botany*. Vol. v., p. 163. Upon further comparison Mr. Baker is of opinion that this fern belongs to *T. crinitum*, Sw., which is identical with *T. L'Hermineri*, Fée, and well figured under the latter name in Fée's *Histoire des Fougères et Lycopodiacées des Antilles*, tab. 28, fig. 1. The fern is also found in Jamaica, Guadeloupe and Grenada as well as in St. Vincent.

Under the title of Hardy species of Eucalyptus mention was lately made in the *Kew Bulletin* (1889, p. 61) of seeds of *Eucalyptus Globulus* received from Mr. Abbott of the Botanic Gardens, Tasmania, and collected from trees growing at high altitudes and accustomed to be exposed to severe frosts. It was hoped that plants raised from these seeds would be likely to bear with impunity the rigours of an English winter. The seeds germinated very freely at Kew and when the plants were strong enough they were put out in a sheltered bay in the Arboretum nursery in the middle of summer in order that they might become established before the approach of winter. The result of the experiment in this particular instance was disappointing. The first hard frosts in 1889 so severely injured them that, notwithstanding the protection they afterwards received from a canvas screen, they all succumbed before the winter was over. At Kew these seedlings from blue gum trees accustomed to severe frosts in Tasmania were, if anything, not so hardy as those of the ordinary forms of *Eucalyptus Globulus*. A similar result has to be recorded with plants raised from seeds of *Eucalyptus coccifera* received at the same time from Tasmania "from trees which were coated with icicles a foot long."

Bermuda Lilies.—It is pleasurable to record that the services rendered by Kew to the Colonies is recognised by private persons as well as through official channels. It will be remembered that in 1887 an exhaustive inquiry was made under the auspices of Kew into the onion disease at Bermuda (*Kew Bulletin*, October 1887). The cultivation of onions is one of the principal industries of the colony, and the threatened destruction of the onion crop was regarded by the people as a matter of grave concern. The inquiry made by Mr. Arthur Shipley, F.L.S., established the fact that the disease was caused by a parasitic fungus (*Peronospora schleideniana*) allied to the well known potato blight. The remedial measures suggested by Mr. Shipley were practical, and it is hoped the disease is now well within the control of the cultivators.

Besides onions, Bermuda is also noted for the cultivation of lilies (*Lilium longiflorum*, var. *Harrisii*), and from Mr. W. T. James, one of the largest growers of these beautiful plants, Kew has received in recognition of its services, a yearly present of bulbs for the decoration of its conservatories. These plants have proved of striking interest to visitors, and have been greatly admired.

ACANTHORHIZA ACULEATA, Wendl. The large specimen of this palm in the Palm House, probably the largest in Europe, is now flowering for the first time. It has a stem 26 feet high, 23 inches in circumference near the base, which is clothed to a height of a foot above the ground with the curious spinous roots peculiar to the genus. The head is about 10 feet high and is composed of about 50 leaves which are orbicular palmate, 5 feet in diameter, dark green above, silvery below, split nearly to the base into about 60 segments. The petioles are 3 feet long, unarmed, the margins clothed with white thread-like fibres 9 inches or more long. The inflorescense is a branched drooping dense panicle of white flowers, which are hermaphrodite. A figure of the plant has been prepared for the *Botanical Magazine*. The species is a native of Central America. It has also been called, *Chamærops stauracantha* and *Thrinax aculeata*. The other species of this genus, viz., *Acanthorhiza arborea* is also in cultivation at Kew.

GLADIOLUS OPPOSITIFLORUS.—Corms of this interesting plant were sent to Kew in July last by Professor MacOwan, F.L.S., Government Botanist at Cape Town, who obtained them from the Transkei, where it is said to be common about the Kei River. The species was described by Herbert in Lindley's *Botanical Register* in 1842, who says it was found in Madagascar by Forbes, a collector for the Royal Horticultural Society, and that "it is also perhaps a native of Natal." In his recently published *Handbook of Irideæ*, Mr. Baker says under this species "Habitat, Transkeian Kaffraria, not certainly indigenous. Said by "Herbert to be a native of Madagascar, but none of the recent collectors "have found it there. Its nearest affinity is with *G. floribundus*." According to Herbert *G. oppositiflorus* is one of the parents of *G. gandavensis*, the other being *G. psittacinus*. *G. oppositiflorus* is now in flower at Kew. It is over 6 feet in height, the leaves are stout and ensiform, and the flowers, which are arranged on a spike 2 feet long are 2½ inches across, the segments wavy and recurved, pure white with lines of amethyst.

CYCADS AT KEW.—The collection of *Cycadaceæ* at Kew is the richest in existence, and many of the specimens are very large and of great age. A considerable number of them have developed cones this year, thereby adding to the attractions of the Palm House, wherein most of the Cycads are grown, as well as affording exceptional opportunities for the study of the order. A collection of the fresh cones and leaves of all the genera was sent from Kew to illustrate the lecture on Cycads given a few weeks ago by W. Carruthers, Esq., F.R.S., before the Royal Horticultural Society. The species which have coned in 1892 are:—*Dioon edule*, *D. spinulosum*, *Ceratozamia mexicana*, *C. miqueliana*, *Zamia muricata*, *Z. Skinneri*, *Macrozamia spiralis*, *M. Fraseri*, *Encephalartos villosus*, *E. Caffer*, *E. Altensteinii*, *Stangeria paradoxa*, *Bowenia spectabilis*, *Cycas circinalis* and *C. revoluta*—male and female cones.

PALMS IN FLOWER AT KEW.—Although palms have always been in favour with cultivators, and this popularity has largely increased in recent years, their nomenclature especially in gardens is considerably confused. This is owing, as Sir Joseph Hooker has stated, "partly to "the impossibility of determining them till they flower, and partly to the "practice that prevails of attaching provisional names to seedlings which "are unrecognisable both as to genus and species when in that state." (*Kew Report*, 1882, p. 10.) The houses at Kew afford exceptional facilities for the growth of most palms to a large size, and as these flower they are carefully examined, and, if of sufficient interest, a figure of them is prepared for publication in the *Botanical Magazine*. Since 1875 no less than 19 species of palms have been figured and described in this publication from specimens flowered at Kew. The following species are now in flower in the various houses:—*Acanthophœnix Cunninghamii*, *Caryota Cummingii*, *C. furfuracea*, *Chamædorea polita*, *C. pulchella*, *C. wobbstiana*, *C. Wendlandii*, *C. scandens*, *Chamærops humilis*, *Didymosperma nanum*, *Howea forsteriana*, *Livistona chinensis*, *Pinanga Kuhlii*, *P. patula*, *P. Smithii*, *Sabal blackburniana*, *Stevensonia grandifolia*, *Synechanthus fibrosus*, *Trachycarpus excelsus*, *Wallichia densiflora*.

From Dr. A. Glaziou, the Director of the Passeio Publico, Rio Janeiro, Kew has received a further consignment of dried plants of the almost inexhaustible FLORA OF BRAZIL, consisting of the numbers 18,835 to 20,187. Dr. Glaziou has been working at the flora of Brazil now nearly a quarter of a century, and has presented to Kew, from time to time, a very full set of the plants he has collected during this long period, in return for their approximate names. But he sends his first set to Berlin for the purposes of the monumental "Flora Brasiliensis," now nearly completed; and, as far as possible, the various natural orders are given for determination to those persons who have elaborated them for the work in question. By this mutually advantageous arrangement Mr. J. G. Baker takes the *Compositæ* and the Filices.

NEW QUEENSLAND PLANTS.—Mr. F. M. Bailey, Colonial Botanist at Brisbane, has sent to Kew another parcel of specimens of his new species. It is a great advantage to possess authenticated specimens of these discoveries, both for the colonists and for botanists in Europe, because important questions may be conclusively answered by their inspection without reference to Australia.

SIAM PRODUCTS.—Members of Her Majesty's Foreign Embassies and Her Majesty's Consular Service have often special opportunities of becoming acquainted with little-known plants and plant products. Many officers belonging to these services have contributed valuable information to Kew and the results have often proved of great importance. For instance, a very interesting report on the manufacture of paper from the bark of *Streblus asper* in Siam by Mr. W. R. D. Beckett, Student Interpreter of Her Majesty's Legation at Bangkok, was printed in the *Kew Bulletin*, 1888, pp. 81–84. Since then Mr. Beckett has made an exploring trip into the Mêkong Valley and brought home numerous specimens which at the request of the Marquis of Salisbury have been worked out at Kew. Amongst Mr. Beckett's specimens were dye-woods, native paper materials, gum and gum resins, woods, safflower, and fibre plants.

Amongst the resins were samples probably derived from the Sâl tree (*Shorea robusta*), possessing properties likely to be valuable in the manufacture of special varnishes. In a report kindly furnished to Kew by Mr. R. Ingham Clark this resin is referred to as follows:—"If there are old forest grounds of the tree producing it, it would be "interesting and more important to find the semi-fossilized kind, for "which no doubt some market could be made." In a further letter, Mr. Clark states:—"We think it a species of Damar; it has a very high "melting point for that kind of gum, viz., 410° Fahr. It runs (that "is, melts and amalgamates with Linseed oil under heat) well, but rather "dark. It contains a considerable amount of moisture, and although "soluble in turpentine it does not amalgamate readily, On account of "the melting point, I should say there might be a practical value in "the article, and it is possible that much better—that is brighter and "paler—specimens might be gathered, as the sample sent is anything "but favourable to the eye. The only method to test it in a sufficient "way to pronounce a definite judgment is to have a bulk sample "of say one-half to one hundredweight, so that one can go beyond "laboratory work."

Mauritius Hurricane.—Consequent upon the terrible hurricane which took place at Mauritius in April, the Department of Forests and Gardens has been closely occupied in clearing the broken trees and disposing of them to the poor to repair and build their huts. In a letter from Mr. William Scott, the Acting Director, he writes:—"We are still going on with the clearing of the Gardens, and have "sent away 400 cords of firewood, and are only half finished with "the work. Many of the surviving trees are green again, or rather "what remains of them, but there are others that appear to have the "life completely thrashed out of them. This is particularly marked "in the Araucarias, Cupressus, Junipers, &c. The whole of the fine "Araucarias are standing like bare poles, with their heads off, and do "not show much appearance of life. We shall not be able to keep "up our exchanges for some time to come. I think about the end of "January we will be in fair order again. All the Filaó trees (*Casu-"arina equisetifolia*) on the *Pas Geometriques* are almost wholly "destroyed, but the virgin forests have not suffered much injury. Our "young plantations are looking well. The Chinese pines (*Pinus "sinensis*) are the best, only about 5 per cent. of them are damaged. "The Eucalypti owe their safety to their youth and suppleness; had "they been older and stronger they would have been broken at a few "feet from the ground. We are at present busy planting Chinese "pines of which we have over 200,000 plants ready."

Bechuanaland Forests.—In a Report on British Bechuanaland recently issued by the Colonial Office [No. 47, Bechuanaland, 1890–1892], the Crown Prosecutor states:—"The wholesale deforestation of "the territory, and of this district in particular, and the exportation of "wood for use as fuel in the diamond mines at Kimberley have caused, "and continue to cause, much alarm. It is an undoubted fact that large "quantities of wood are cut on unoccupied private lands without the con-"sent of the owners. As these owners are not resident in the territory, "convictions under the Forest and Herbage Preservation Act, 1859, are "not easily obtainable. The evil can only be prevented by most stringent "and arbitrary means. A law prohibiting the exportation of wood

" would effect the desired result, but it would, I apprehend, be against the " spirit of the Customs Union Convention." The Administrator, Sir Sidney Shippard, fully realises the situation, but is unable at present to suggest a remedy. "In view of the conditions of the Customs Union," he says, "an export duty on wood could not be imposed in this territory " without the express consent of the Cape Colony and of the Orange Free " State. A preventive might at one time have been found in Mr. A. H. F. " Duncan's suggestion as to establishing a forest department under " the Surveyor-General; but since some of the finest forests in the " western portion of the Crown Colony have been included in the grants " of land made in consideration of railway construction this Government " no longer has the same interest in the question." Something, however, appears to be attempted in the way of protecting the remaining forests, as we learn from the Surveyor-General's Report that "at Kuruman 32,183 morgen have been surveyed, and set apart as a Crown Reserve." It is desirable in every way that this latter policy should be extended as much as possible.

The Right Hon. Sir John Lubbock has published a work in two octavo volumes, with 684 figures (Kegan Paul & Co.), entitled "A CONTRIBUTION TO OUR KNOWLEDGE OF SEEDLINGS." The origin of the research is explained in the following extract from the preface:— "The germination of plants is certainly not the least interesting " portion of their life history, but it has not as yet attracted the " attention it deserves. The forms of cotyledons, and the fact that " they differ so much from the subsequent leaves, had of course been " alluded to, more or less fully, in botanical works, but no explanation " had been offered, and Klebs, in a recent memoir, expressly states that " the problem is still an enigma. Under these circumstances it seemed " to me that the subject was very promising, and it was evident that " Kew would afford unrivalled opportunities for such an investigation." The work describes on a uniform plan a vast number of examples of germination drawn from all parts of the Vegetable Kingdom, and far surpasses in extent any previous investigation of the subject. The living material was almost wholly supplied by the Propagating Department of the Royal Gardens.

COLEUS TUBEROSUS, Benth.—A plant believed to be this species (=Plectranthus tuberosus, *Bl.*) is cultivated in Java for the sake of its edible tubers. The same, or a closely allied tuberous labiate (*Coleus parviflorus*, Benth.), is said to be cultivated also in Ceylon. Recently, tubers of the Java plant were obtained from Dr. Treub, Director of the Botanical Gardens, Buitenzorg, and grown at Kew. The tubers were planted in an open border during the summer, and the crop was reaped in the middle of October. The tubers were fairly numerous, but small. They consisted of fleshy bodies broad at the top and narrowing gradually to a point. They were of a light brown colour, and averaging in size about an inch and a half long and an inch in diameter. It is probable that the tubers attain a larger size in the tropics. A further trial will be made next year, and in a more sandy soil. When a sufficient number of the tubers has been raised at Kew they will be distributed for trial in the lowlands of West Africa and the West Indies, where the ordinary potato, for which the Coleus tubers are said to be a substitute, cannot be successfully cultivated. A tuberous labiate (*Plectranthus madagascariensis*, Benth.), described in Baker's

Flora of Mauritius and the Seychelles, p. 258, is occasionally cultivated in Madagascar and Mauritius. In the latter island it is known as *Oumime* or *Houmime*. This plant has a wide distribution, and is found also in Arabia Felix and Natal. In November 1887, Kew received from Mr. Medley Wood, A.L.S., Curator of the Botanic Gardens at Durban, Natal, tubers of two varieties or species of *Plectranthus*, known locally as "Kaffir potato." We have botanical specimens of these plants in the Herbarium (Natal, 646 and 3,633), and they are evidently quite distinct from *Plectranthus madagascariensis*. A specimen just to hand in the Transvaal collections of Mr. Galpin agrees with Mr. Wood's specimens from Natal. The tubers received by MM. Pallieux and Bois from the Transvaal under the name of "Matambala," and referred by them to Coleus tuberosus (*Revue des Sciences Naturelles Appliquées*, 1891, p. 684), may prove to be identical with the "Kaffir potato" (*Plectranthus* sp.) of Mr. Medley Wood, or even with *Plectranthus madagascariensis*. In any case they have been distributed from Paris to the Gaboon and other French colonies, and are said to thrive there extremely well.

Lists of Cultivated Plants.—The progress made in establishing the Botanical Station at Lagos has been frequently noticed (*Kew Bulletin*, 1888, p. 149; 1889, p. 69; 1890, p. 162; and 1891, p. 46). This station was started by Sir Alfred Moloney, in November 1887, and Mr. James McNair, formerly connected with the Botanical Department in Jamaica, was appointed Curator. Since that time considerable success has been attained in cultivating plants received from Kew and elsewhere, and large numbers possessing industrial value have been distributed in the Colony. On the retirement of Mr. McNair in 1891, Mr. Henry Millen from Kew was selected to succeed him. Mr. Millen has received valuable assistance from Dr. Rowland, the Colonial Surgeon. Under their joint authorship the Lagos Government has printed a list of plants cultivated at the station, 443 in number, with notes descriptive of their economic uses. Lists of this kind might be usefully prepared at every Colonial Botanical Establishment. They supply at a glance the particular plants that are available for distribution locally, and they give also information respecting the uses to which the plants or their products could be applied. Such lists might be printed in a pamphlet form and given to visitors, free, or for a small payment to cover the cost of production.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1892.

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1892.

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